

METHOD AND APPARATUS FOR SOLVING AN UNCONSTRAINED GLOBAL OPTIMIZATION PROBLEM

ABSTRACT

One embodiment of the present invention provides a system that receives a representation of the function f and stores the representation in a memory. Next, the system performs an interval global optimization process to compute guaranteed bounds on a globally minimum value of the function $f(\mathbf{x})$ over a subbox \mathbf{X} . This interval global optimization process applies term consistency to a set of relations associated with the function f over the subbox \mathbf{X} , and excludes any portion of the subbox \mathbf{X} that violates any member of the set of relations. It also applies box consistency to the set of relations associated with the function f over the subbox \mathbf{X} , and excludes any portion of the subbox \mathbf{X} that violates the set of relations. The interval global optimization process also performs an interval Newton step on the subbox \mathbf{X} to produce a resulting subbox \mathbf{Y} , wherein the point of expansion of the interval Newton step is a point \mathbf{x} within the subbox \mathbf{X} , and wherein performing the interval Newton step involves evaluating the gradient $\mathbf{g}(\mathbf{x})$ of the function $f(\mathbf{x})$ using interval arithmetic. The system integrates the sub-parts of the process with branch tests designed to increase the overall speed of the process.